EHC ED Critical Care

Induced Hypothermia Protocol

Name:

Place Sticker

MRN:

Date: ☐ Time of Screening: ☐

Inclusion Criteria (Must have All)

- ☐ Post Cardiac Arrest (Any rhythm as cause of arrest is eligible)
- ☐ ROSC < 30 min from EMS/Code Team Arrival
- ☐ Time now <6 hrs from ROSC
- ☐ Comatose (See Neuro Screening)
- ☐ MAP > 65 on no more than one vasopressor

Exclusion Criteria

- ☐ Pt has DNR, poor baseline status, or terminal disease
- ☐ Active or Intracranial Bleeding
- ☐ Traumatic etiology for arrest
- ☐ Cryoglobulinemia
- ☐ Pregnancy (Relative-Consider OB/Gyn consult)
- ☐ Recent Major Surgery (Relative)
- ☐ Sepsis as cause of Arrest (Relative)

Neurologic Screening

Eye Opening	**Verbal**	**Motor**	**Brainstem**
Spontaneous --------*☐ 4	Oriented ----------*☐ 5	Obeys ----------*☐ 6	Pupils React ☐ yes ☐ no
Voice----------*☐ 3	Confused ----------*☐ 4	Localizes ----------*☐ 5	Corneal ☐ yes ☐ no
Pain ----------*☐ 2	Inappropriate -------*☐ 3	Withdraws ---------- ☐ 4	Spontaneous
None ---------- ☐ 1	Sounds----------*☐ 2	Decorticate---------- ☐ 3	Respirations ☐ yes ☐ no
	None ---------- ☐ 1	Decerebrate --------- ☐ 2	Doll's Eyes ☐ yes ☐ no
	Intubated ---------- ☐ 1	None ---------- ☐ 1	
DTRs:	**Bicep** L R	**Knee** L R	**Toes** L R

List any Sedatives or Paralytics On-Board at time of Exam: ☐

If any Starred (*) Item is checked off on the neuro exam, the patient is ineligible for the protocol.

Protocol

- •Discuss Case with ICU Fellow or Attending (They must agree with the plan for hypothermia and an ICU bed must be available in next few hours)
- •Time of Discussion: ☐ If pt is deemed ineligible by ICU, list reason: ☐
- •Send blood for: CMP, LFTs, Superstat I, Lactate, CBC, PT/PTT, CK/MB/Troponin, Lipase/Amylase
- •Place foley catheter and monitor urine output.
- •Completely expose patient and place cooling blanket above and below.
- •Place temp probe in patient's rectum (5 cm) or esophagus (38-42 cm)
- •Hook both cooling blankets and the probe to the same blanketrol machine.
- •Set the machine to "Auto Control" and the set temperature to 33º C.
- •List time Now: ☐ List Initial Patient Temperature: ☐
- •If initial temperature is < 34º C, allow patient to warm to 33º C.
- •Begin opioids & sedation. Titrate to Ramsay Score 4/5.
- •Infuse refrigerated crystalloid preferably through large bore, peripheral IV.
  Amount of crystalloid is **(Initial Temp °C - 34 = liters of iced saline)** Maximum initial infusion is 30 cc/kg.
  Administer at ~100 ml per minute using pressure bags.
- •Administer Tylenol 650 mg GT Q 6 hours and Buspirone 30 mg GT Q 8 hours unless pt has allergy or on MAO inhibitor.
- •If during induction, pt has shivering unrelieved by the above meds, Vecuronium 0.1 mg/kg x1 can be used
- •The goal temperature is 34º C; after initial infusion is completed, wait 15 minutes. If temp > 34º C, infuse 250 cc boluses of cold crystalloid Q 10 min until <34.5º C
- •Total Cold Crystalloid Infused: ☐ Time that Pt reaches 34º C: ☐
- •If patient's temperature rises above 34.5º C, infuse 250 cc boluses of cold crystalloid Q 10 min until <34.5º C.
- •Assess for shivering Q 15 minutes. If any signs of shivering, see the protocol on page 2.
- •Maintain temperature 32-34º C for 24 hours (ideal temperature is 33º C).
- •If significant bleeding or hemodynamic instability, begin rewarming. **See ehced.org for protocol.**
- •Time of Rewarming: ☐ Reason Necessary: ☐
- •Maintain MAP>80: Pressors and/or Dobutamine may be used during protocol, if fluid loading ineffective.

7/14/08

Scan this worksheet when pt's bed is ready and Give Original to ICU Resident

EHC ED Critical Care

Post-ROSC Care Package

Induction of Hypothermia

See First Page

Procedures

- Full sterile neck line with CVP monitoring
- Full sterile femoral arterial line (Axillary if femoral contraindicated/unsuccessful)
- Foley Catheter with hourly urine monitoring
- Orogastric Tube on suction

Ventilation

- Send an ABG, **DO NOT INDICATE THE PATIENT'S TEMPERATURE ON THE ABG ORDER**
- Place patient on AC Mode
- Set Vt to 8 ml/kg IBW (see last page)
- Set IFR to 60 lpm
- Set Initial rate to 18 bpm
- Set Initial O2 to 50%
- Titrate FiO2/PEEP to achieve corrected ABG PaO2 > 60. To correct ABG O2 for temperature: Subtract 5 mm Hg for every 1 C below 37° C.
- Often pulse ox will not read well due to peripheral vasoconstriction

Hemodynamic Goals

- **Ensure Adequate Preload**
  Assess by passive leg raise, pulse pressure variation, and echo. CVP may provide some indication if very low. Use normal saline or lactated ringers boluses. Use room temperature fluid if patient at goal temperature. Replace patient's urine losses 1:1
- **MAP > 65** at all times, MAP > 80 is preferred to augment cerebral perfusion
  Preferred initial pressor is norepinephrine, may add vasopressin if necessary
  If MAP is < 80 and CVP > 10 perform passive straight leg raise to assess fluid responsiveness.
  If MAP > 100, start nitroglycerin infusion
- **Corrected ScvO2 > 70**
  Can be measured by PreSEP catheter or corrected central venous O2 saturation (send blood gas as mixed venous **WITH PATIENT'S TEMPERATURE ON THE ORDER**)
  If ScvO2 < 70 and HB < 7 (some would advocate <10 as trigger), transfuse patient
  If HB > 7, evaluate echocardiogram and consider inotropes vs. balloon pump/revascularization
- **Lactate**
  Hypothermia will raise lactate levels and post-arrest patients will have high lactate. Send a baseline level after the patient achieves goal temperature. From this point on, the lactate should stay the same or drop. If lactate is increasing, the patient is under-resuscitated or seizing

Sedation

- To gain the full benefits of hypothermia, it is imperative that the patient is adequately sedated
- Optimize fentanyl infusion rate first
- Add on propofol if necessary
- Titrate to Ramsay Score of 4/5 (see last page)

EHC ED Critical Care

Post-ROSC Care Package

Labs & Electrolytes

- Send Superstat I (ABG with Electrolytes) and Lactate Q 1 hour for first 4 hours, then Q 4 hours
- On arrival, send CMP, CBC, Lytes, PT/PTT, Lipase, Cardiac Enzymes, Type and Hold, Pan-Cultures
- Send CMP (complete metabolic panel) and CBC Q 4 hours
- Send Cardiac Enzymes Q 8 hours
- Keep Magnesium at high-normal at all times with aggressive IV repletion
- Replete Potassium if < 3.4 with IV KCl
- Keep iCal at high normal at all times
- Keep Sodium at least 140 at all times, 150 is preferable
- Keep Glucose < 150 with subcutaneous or Drip Insulin

Cardiac Testing

- Get EKG immediately upon arrival; at the start of hypothermia induction; and Q 1 hour for the first 4 hours
- If possible, get a bedside transthoracic echo at the start of induction. In the ED, this should be performed by the emergency physician or cardiology. Look specifically for qualitative LV function, RV function, pericardial effusion/tamponade, & gross valve function

DVT Prophylaxis

- If no contraindication, Heparin 5000 units subcutaneous Q 8 hours

Stress Ulcer Prophylaxis

- Nexium 40 mg IVSS

VAP Prophylaxis

- Head of bed to 30°
- Place in-line closed suction and perform aggressive pulmonary toilet

Additional Testing

- Consider Head CT if possible neurologic cause to arrest. Note: even an intracranial bleed is not a contra-indication to continuation of induced hypothermia. Consider letting the patient drift to 34°C and administration of dDAVP.
- Consider CTA if strong suspicion of PE as the cause of arrest. Bedside dopplers by EP or sono technician may be good first step
- EEG if seizures (convulsive or non-convulsive) are suspected

Revascularization for STEMI

- PCI is preferred, consult with CPORT fellow/attending and CCU fellow. Hypothermia does not need to be discontinued for PCI
- If PCI is not available or will be delayed, thrombolysis should be administered. Thrombolysis can be given during hypothermia. CPR performed prior to ROSC should not stop reperfusion therapy. Use standard doses of Retevase. Consult with CPORT fellow/attending.

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Post-ROSC Care Package Cont.

Ramsay Sedation Scale

1 Patient is anxious and agitated or restless, or both
2 Patient is co-operative, oriented, and tranquil
3 Patient responds to commands only
4 Patient exhibits brisk response to light glabellar tap or loud auditory stimulus
5 Patient exhibits a sluggish response to light glabellar tap or loud auditory stimulus
6 Patient exhibits no response

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Induced Hypothermia Shivering Protocol

Shivering Protocol After Induction

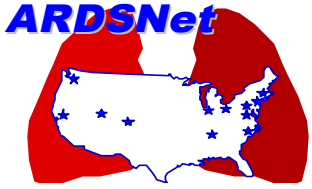
Bedside Shivering Assessment (BSAS) (Neurocrit Care 2007;6:213)
0-None, no shivering. Must not have shivering on EKG or palpation.
1-Mild-localized to neck/thorax. May only be noticed on palpation or EKG.
2-Moderate-intermittent involvement of upper extremities +/- thorax
3-Severe-generalized shivering or sustaine dupper extremity shivering

•All patients receive
Acetaminophen 650 mg GT Q 6 hours unless allergic and
Buspirone 30 mg GT Q 8 hours unless allergic or on MAO Inhibitors

•If BSAS > 1, add **Fentanyl Drip** (titrate as per EHCED drip sheet)
•If BSAS still > 1, add **Propofol Drip** (titrate as per EHCED drip sheet)
•If BSAS still > 1 after titration of sedation/opioid, add **Nimbex** 0.15 mg/kg IV Q 1 hour PRN
Paralysis should only be necessary under extraordinary circumstances!

EHC ED Critical Care

ARDSNet Vent Protocol



NIH NHLBI ARDS Clinical Network
Mechanical Ventilation Protocol Summary
www.ardsnet.org

INCLUSION CRITERIA: Acute onset of
1. $PaO_2/FiO_2 \leq 300$ (corrected for altitude)
2. Bilateral (patchy, diffuse, or homogeneous) infiltrates consistent with pulmonary edema
3. No clinical evidence of left atrial hypertension

PART I: VENTILATOR SETUP AND ADJUSTMENT
1. Calculate predicted body weight (PBW)
   Males = 50 + 2.3 [height (inches) - 60]
   Females = 45.5 + 2.3 [height (inches) -60]
2. Select Assist Control Mode
3. Set initial TV to 8 ml/kg PBW
4. Reduce TV by 1 ml/kg at intervals ≤ 2 hours until TV = 6ml/kg PBW.
5. Set initial rate to approximate baseline VE (not > 35 bpm).
6. Adjust TV and RR to achieve pH and plateau pressure goals below.
7. Set inspiratory flow rate above patient demand (usually > 80L/min)

OXYGENATION GOAL: PaO_2 55-80 mmHg or SpO_2 88-95%
Use incremental FiO_2/PEEP combinations below to achieve goal

FiO_2	0.3	0.4	0.4	0.5	0.5	0.6	0.7	0.7
PEEP	5	5	8	8	10	10	10	12

FiO_2	0.7	0.8	0.9	0.9	0.9	1.0	1.0	1.0
PEEP	14	14	14	16	18	20	22	24

PLATEAU PRESSURE GOAL: ≤ 30 cm H_2O
Check Pplat (0.5 second inspiratory pause), SpO_2, Total RR, TV and pH (if available) at least q 4h and after each change in PEEP or TV.

If Pplat > 30 cm H_2O: decrease TV by 1 ml/kg steps (minimum = 4 ml/kg).
If Pplat < 25 cm H_2O: TV < 6 ml/kg, increase TV by 1 ml/kg until Pplat > 25 cm H_2O or TV = 6 ml/kg.
If Pplat < 30 and breath stacking occurs: may increase TV in 1 ml/kg increments (maximum = 8 ml/kg).

pH GOAL: 7.30-7.45
Acidosis Management: (pH < 7.30)
If pH 7.15-7.30: Increase RR until pH > 7.30 or $PaCO_2$ < 25 (Maximum RR = 35).
If RR = 35 and $PaCO_2$ < 25, may give $NaHCO_3$.
If pH < 7.15: Increase RR to 35.
If pH remains < 7.15 and $NaHCO_3$ considered or infused, TV may be increased in 1 ml/kg steps until pH > 7.15 (Pplat target may be exceeded).
Alkalosis Management: (pH > 7.45) Decrease vent rate if possible.

07/18/08